AD-A144 986 ANALYSIS OF COMPUTER AND COMMUNICATION INFORMATION PROCESSING AND SYSTEM DEVELOPMENT(U) CALIFORNIA UNIV LOS ANGELES GRADUATE SCHOOL OF MANAGEMENT B P LIENTZ 1/1

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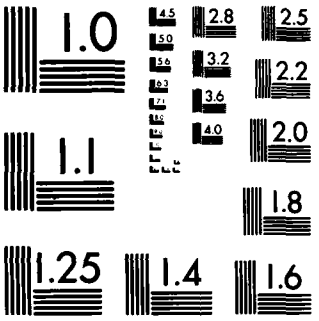

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FINAL REPORT

Contract N00014-75-C-0266

Project No. NR 049-345

Principal Investigator: Professor Bennet P. Lientz

Graduate School of Management

University of California

Los Angeles, CA 90024

Information Systems Program

Office of Naval Research

Arlington, Virginia 22217

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This report constitutes the final report for contract N00014-75-C-0266 and addresses work performed during the period from April 1, 1982 through March 31, 1983. Work performed in earlier periods has been covered in prior annual reports for the same contract. Research is continuing in related areas under a separate contract from the same agency.

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The reports issued during the annual period through March 31, 1983 include the following:

1. Lientz, B.P. and K.P. Rea, "Distributed Systems Development and Maintenance," Management of Distributed Data Processing (J. Akoka, ed.), Amsterdam: North Holland Publishing, 1982, pp. 79-88.

2. Swanson, E.B. "Information Channel Disposition and Use," UCLA Graduate School of Management report, December, 1982.

3. Swanson, E.B. "Toward a Measure of Information Channel Disposition," UCLA Graduate School of Management report, December, 1982.

The first paper is a chapter in a book on distributed systems. The second paper has been submitted to SMIS Quarterly; the third has been submitted to Omega.

During the year the two major areas of research were software maintenance and information systems measurement. Previous work in maintenance was based on a centralized environment. With the increase in power and capability of microcomputers in increasing issue of interest is their use in maintenance. This is especially true when one considers that much of the maintenance effort is in a local mode without requirements for a mainframe host except for integration; testing, and reinstallation.

There are workstations today which cost approximately $15,000-$20,000 and which are compatible with host standard languages. The first paper listed above addressed issues related to this use of distributed systems. Of particular interest are that there are substantial benefits to the use of such systems in aiding management task progress and control the configuration of the software.

Based on this work research is now being done to define the characteristics and requirements of these workstations so as to be most useful in software maintenance. The work will also be applicable to enhancements and new system development.

Another subject that is being investigated is the use of graphics/color and other displays of maintenance data. Data that would be of use in managing the maintenance process has been defined. Work is now being done to assess how to portray the information. This, perhaps, may be another application suitable for a microcomputer. Initially, the management reporting consists of summary project and configuration information. This can then be extended to more detailed data, if it is available. The trade-off here is between the value of the data and the effort and cost in collection, aggregating and summarizing the data.

The second major area of the current research is that of measurement of systems. In paper 2 a model is proposed in which the disposition of a user of an information channel is conceived as composed of two components. These are the information quality and the access quality attributed to the channel. This stems from earlier work which highlighted user involvement as a major issue in development and maintenance. It is hypothesized that favorable channel disposition on the whole can explain discretionary channel employment behavior.

A study of the dispositions of users of ten management information systems reports in four organizational settings confirms the importance of attributed information value in explaining use. Information accessibility, on the other hand, does not explain report use, when information value is controlled, though it is related directly to user satisfaction, which emerges as a concept distinct from channel disposition.

This work was based on the definitions set forth in paper 3. Information channel disposition is introduced as an attitudinal construct applicable to the development of descriptive theory of information seeking behavior in organizations. It is conceived as a manifold of valuations by an individual about the quality of information access provided by a particular information channel. A semantic differential solving technique is suggested for measurement purposes. The dimensionality of the construct is explored by means of a factor analysis of 186 user evaluations of ten management reports.

In addition to current research a summary of work under the entire contract is appropriate here. During the period of the contract over forty technical reports and papers were prepared. In addition to several books research results have been published in the following journals:

- o Communications of ACM
- o Omega
- o SMIS Quarterly
- o Information Science
- o Computer Networks
- o California CPA Quarterly
- o CPA Journal
- o Israel Journal of Engineering
- o IEEE Transactions on Reliability
- o Naval Research Logistics Quarterly

Some of the highlights of the research program include:

- o Development and implementation of a trade-off model for computer-communication analysis. The model was used to assess the impact of various security measures in distributed systems environments.

- Assessment of software maintenance - For the last few years a major emphasis has been on surveying and analyzing the state of software maintenance for application systems. Several surveys were undertaken, including a larger effort involving a sample of almost 500 firms and organizations.

- Development of software development and maintenance framework. As a result of data collected and analysis a method of classification of maintenance activities was devised. *In addition key* determinants which impact maintenance were identified and statistically supported. These can be used to and in the management of new development.

- Management of distributed systems development and maintenance. During the contract our effort was begun to identify the potential of using small microcomputers and minicomputers for development and maintenance. A methodology was devised for addressing maintenance.

- Application of research results. In addition to publication, presentation, and support applied work was performed in support of various Naval and government projects. Several federal agencies have adopted the maintenance classification approach developed in the contract. In addition the work was adopted to aid in assessing the state of current Naval weapons software systems. The analysis model mentioned was applied to several Naval laboratory situations.

The following people were supported under the contract: Professor Bennet P. Lientz, Professor E. Burton Swanson, Harold Plain (Ph.D. student), and G. Christensen (Ph.D. student). In addition a limited amount of funding was provided for secretarial support.

Professor Lientz, served as Vice Chairman of the Graduate School (through June 1982), as Chairman of the Academic Senate Committee on Academic Computing, and as Chairman of Computers and Information Systems. During the year he served as Program Committee co-chairman for the National Computer Conference (1983). He served as a lecturer in the Engineering and Management Program and as organizer of the National Conference on Data Base Management Systems. He gave invited presentations at the Art Museum Association, at ESSEC University in Paris, France, and at the Consumer Bankers Association in Dallas, Texas.

Professor Swanson is serving as Assistant Dean for the Doctoral Program in the Graduate School of Management. During th Fall of 1982, he as a visiting Professor at the IBM European Systems Research Institute in La Hulpe, Belgium. During the current year two doctoral students were partially supported by the contract. Hal Plain is completing his dissertation proposal and is pursuing maintenance issues in a distributed setting. Gunnar Christensen is doing research in systems measurement.

During the overall time of the contract over twelve doctoral students were partially supported. Some of these students and their current positions are:

- Ira Weiss, Associate Professor,
  University of Houston

- Leslie Porter, Assistant Professor,
  Harvard University

- Stephen Kwan, Assistant Professor,
  Boston University

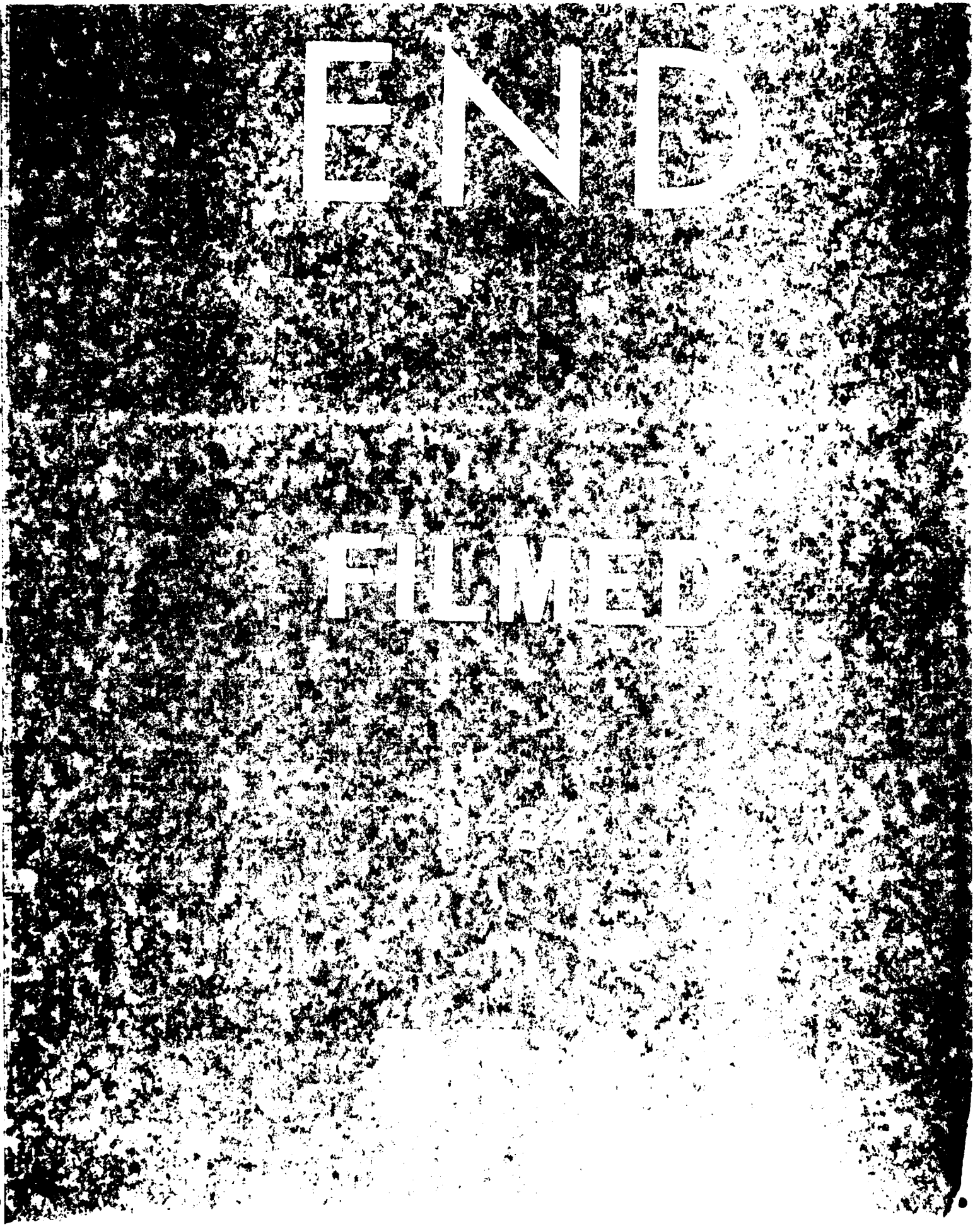
- Cynthia Mathis Beath (current student)

- Gerry Tompkins, Assistant Professor,
  Catholic University, Brazil

- Kweku Ewusi Mensah, Assistant Professor,
  University of Hawaii

- Kurt Fischer, Senior Scientist,
  University of Hawaii

Without contract support it is unlikely that as much progress could have been made by these students.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